CLAIMS

What is claimed is:

1. A two-phase switched reluctance machine (TPSRM), comprising:

a stator having a plurality of poles and a ferromagnetic or iron back material; and

a rotor having a plurality of poles and a ferromagnetic or iron back material, wherein:

current flowing through coils wound around a first set of the plurality of stator poles induces a flux flow through the first set of stator poles and portions of the stator back material during a first excitation phase,

current flowing through coils wound around a second set of the plurality of stator poles induces a flux flow through the second set of stator poles and portions of the stator back material during a second excitation phase, and

the numbers of stator and rotor poles are selected such that substantially no flux reversal occurs in any part of the stator back material as a result of transitioning between the first and second excitation phases.

2. The TPSRM of claim 1, wherein the number of stator poles is 6 and the number of rotor poles is 3.

3. The TPSRM of claim 1, wherein the number of stator poles is 6 and the number of rotor poles is 9.

4. The TPSRM of claim 1, wherein the number of stator poles is 6 and the number of rotor poles is 15.

5. The TPSRM of claim 1, wherein the stator or rotor poles provide a non-zero combined torque for all rotational positions of the rotor during which at least one of the first and second phases is excited or a transition is occurring between the first and second phase excitations.

6. The TPSRM of claim 5, wherein the distal end faces of the stator or rotor poles are contoured to have a non-uniform radius from the rotor's axis of rotation.

7. The TPSRM of claim 5, wherein the rotor poles are slotted.

8. The TPSRM of claim 1, wherein one stator pole in each of the first and second sets has a maximum flux density flow rate that is about twice the maximum flux density flow rate of the other stator poles in the set.

9. The TPSRM of claim 1, wherein one stator pole in each of the first and second sets conveys about twice or more the amount of flux density conveyed by the other stator poles in the set.

10. The TPSRM of claim 1, wherein the coil wound around one stator pole in each of the first and second sets has twice the number of windings as the coils wound around the other stator poles in the set.

11. The TPSRM of claim 1, wherein further comprising a controller that provides about twice as much current to the coil wound around one stator pole in each of the first and second sets as is provided to the other stator poles in the set.

12. The TPSRM of claim 1, wherein the numbers of stator and rotor poles are further selected such that a flux reversal occurs only once in any part of the rotor back material, excluding the rotor poles, per revolution of the rotor as a result of transitioning between the first and second excitation phases.

13. The TPSRM of claim 1, wherein the vector sum of normal forces exerted by the stator poles, in response to the first and second excitation phases, at any instant of time is zero.

14. A two-phase switched reluctance machine (TPSRM), comprising:

a stator having a plurality of poles and a ferromagnetic or iron back material; and

a rotor having a plurality of poles and a ferromagnetic or iron back material, wherein:

current flowing through coils wound around a first set of the plurality of stator poles induces a flux flow through the first set of stator poles and portions of the stator back material during a first excitation phase,

current flowing through coils wound around a second set of the plurality of stator poles induces a flux flow through the second set of stator poles and portions of the stator back material during a second excitation phase, and

the numbers of stator and rotor poles are selected such that a flux induced by each of the first and second excitation phases flows through a path encompassing about two-thirds of the circumference of each of the rotor and stator back materials.

15. A method of operating a two-phase switched reluctance machine (TPSRM), comprising:

inducing an electromagnetic flux to flow through a first set of poles of a stator of the TPSRM during a first excitation phase;

inducing an electromagnetic flux to flow through a second set of poles of the stator during a second excitation phase; and

transitioning between the first and second excitation phases without creating a substantial flux reversal in a ferromagnetic or iron back material of the stator.

16. The method of claim 15, wherein the electromagnetic flux induces a torque to a rotor of the TPSRM and the combined torque provided by both the first and second excitation phases produces a non-zero value for all rotational positions of the rotor during which at least one of the first and second phases is excited or a transition is occurring between the first and second phase excitations.

17. The method of claim 15, wherein one stator pole in each of the first and second sets has a maximum flux density flow rate that is about twice the maximum flux density flow rate of the other stator poles in the set.

18. The method of claim 15, further comprising inducing about twice as much flux density to flow in one stator pole in each of the first and second sets as flows in the other stator poles in the set.

19. The method of claim 15, wherein a flux reversal substantially occurs only once in any part of a ferromagnetic or iron back material of a rotor of the TPSRM, excluding poles of the rotor, per revolution of the rotor as a result of transitioning between the first and second excitation phases.

20. The method of claim 15, further comprising regulating the electromagnetic flux flow through the stator poles during each of the first and second excitation phases to exert substantially a zero value vector sum of normal forces by the stator poles at any instant of time during the first or second excitation phases.